Nuclear Operating Company
South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

July 27, 2004
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U. S. Nuclear Regulatory Commission
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South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Response to NRC Bulletin 2004-01,
"Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized-Water Reactors"

In accordance with 10CFR50.54(f), STP Nuclear Operating Company submits the 60-day response to Nuclear Regulatory Commission (NRC) Bulletin 2004-01, "Inspection of Alloy 82/182/600 Material used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized-Water Reactors," dated May 28, 2004.

NRC Bulletin 2004-01 requested information related to the materials from which the pressurizer penetrations and steam space piping connections at licensee facilities were fabricated and information related to the inspections that have been and those that will be performed to ensure that degradation of Alloy 82/182/600 materials used in the fabrication of pressurizer penetrations and steam space piping connections is identified, adequately characterized, and repaired. The requested information is attached. The commitments made in this report are listed in Attachment 2.

If there are any questions regarding this additional information, please contact Mr. Scott Head at (361) 972-7136 or me at (361) 972-7902.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on July 27, 2004

T. J. Jordan
Vice President
Engineering & Technical Services

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Attachment 1: Response to NRC Bulletin 2004-01
Attachment 2: List of Commitments

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cc: (paper copy)

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Response to NRC Bulletin 2004-01, "Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections At Pressurized-Water Reactors"

NRC Request:

(1) All subject PWR licensees are requested to provide the following information within 60 days of the date of this bulletin. [For lines attached directly to the pressurizer, with the exception of the surge line, the information requested in (1) and (2) above should be provided for any locations, including those remote from the pressurizer shell, which contain Alloy 82/182/600 materials which are exposed to conditions similar to those of the pressurizer environment.]

(a) A description of the pressurizer penetrations and steam space piping connections at your plant. At a minimum, this description should include materials of construction (e.g., stainless steel piping and/or weld metal, Alloy 600 piping/sleeves, Alloy 82/182 weld metal or buttering, etc.), joint design (e.g., partial penetration welds, full penetration welds, bolted connections, etc.), and, in the case of welded joints, whether or not the weld was stress-relieved prior to being put into service. Additional information relevant with respect to determining the susceptibility of your plant's pressurizer penetrations and steam space piping connections to PWSCC should also be included.

STPNOC Response:

There are no Alloy 600 components in the STPEGS Unit 1 and Unit 2 pressurizers. The STPEGS Unit 1 and Unit 2 pressurizer heater sleeves are stainless steel with stainless steel weld materials. Alloy 82/182 welds are present in a steam space environment in the upper head penetration to safe end connections. Table 1 below identifies the STPEGS pressurizer penetration Alloy 82/182 weld locations and design details.

Table 1 – STPEGS Pressurizer 82/182 Butt Welds

Component	Material	Joint Design
Pressurizer Safety Nozzle to Safe End (3 locations)	Alloy 82/182	Full Penetration Butt Weld on Alloy 82/182 Buttering
Pressurizer Relief Nozzle to Safe End	Alloy 82/182	Full Penetration Butt Weld on Alloy 82/182 Buttering
Pressurizer Spray Nozzle to Safe End	Alloy 82/182	Full Penetration Butt Weld on Alloy 82/182 Buttering

Table 2 below provides information on the pressurizer penetrations and steam space piping connections, including materials of construction joint design, and whether or not the weld was stress-relieved prior to being put into service, for STPEGS Units 1 and 2.

Table 2 – STPEGS Pressurizer Penetration and Steam Space Piping Information

	Component	Material	Post Weld Heat Treated?
1	Spray/Relief/Safety Nozzles	Carbon Steel SA-508 CL. 2A ASME SFA 5.11 EniCrFe-3 (182) and SFA 5.14 ERNiCr-3(82) buttering for Safe End weld	Yes
2	Spray/Relief/Safety Nozzle Safe Ends	Stainless Steel SA-182 F316L	N/A
3	Spray/Relief/Safety Nozzle to Safe End Welds	Full Penetration Butt Weld, ASME SFA 5.11 EniCrFe-3 (182) and SFA 5.14 ERNiCr-3(82)	No
4	Instrument and Sample Nozzle Penetrations/Coupling	Stainless Steel SA-213 Type 316 to SA-182 F316(coupling)	N/A
5	Instrument and Sample Nozzle Penetrations to Pressurizer Cladding Weld	Fillet welded to pad built-up on the cladding on the ID ER308/309 filler metal	No
6	Heater Nozzles and Heater Well Coupling	Stainless Steel SA-182 F316	N/A
7	Immersion Heater Well	SA-213 Type 316	N/A
8	Heater Nozzles to Pressurizer Cladding and Heater Well Coupling	SFA-5.9 Class ER308/309 filler metal	No

NRC Request:

(b) A description of the inspection program for Alloy 82/182/600 pressurizer penetrations and steam space piping connections that has been implemented at your plant. The description should include when the inspections were performed; the areas, penetrations and steam space piping connections inspected; the extent (percentage) of coverage achieved for each location which was inspected; the inspection methods used; the process used to resolve any inspection findings; the quality of the documentation of the inspections (e.g., written report, video record, photographs); and, the basis for concluding that your plant satisfies applicable regulatory requirements related to the integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections were found, indicate what followup NDE was performed to characterize flaws in the leaking penetrations.

STPNOC Response:

In addition to the ASME Section XI required examinations, STP performed "Bare Metal Visual" (BMV) inspections on all steam space nozzles during the most recent Unit 2 refueling outage (2RE10) in the Spring of 2004. There was no evidence indicating any pressure boundary leakage from these nozzle safe ends of the pressurizer, nor was there any evidence of corrosion or wastage. A complete bare metal visual examination was achieved at each of the nozzle safe ends. A VT-1 visual examination method was performed by a certified Level III visual examiner using a flashlight and an 18% neutral gray card with 1/32" width black line to assure adequate lighting for resolution of any indications. A written report and sampling of digital photographs were used to document the examinations. If any indications had been detected, they would have also been recorded by digital photographs. Similar inspections are scheduled for the next Unit 1 refueling outage (1RE12) in Spring 2005 for the steam space piping and the surge line. The BMV inspections were scheduled and implemented in response to the Tsuruga recommendations contained in EPRI MRP 2003-039, issued January 20, 2004.

The pressurizer is visually inspected during the Generic Letter 88-05 boric acid control program walkdowns each outage, implemented by STPEGS procedure surveillance test procedure 0PGP03-ZE-0033 (RCS Pressure Boundary Inspection for Boric Acid Leaks). This walkdown does not remove any pressurizer component insulation; however, 100 percent of the insulation areas surrounding the welds are examined at the beginning of each refueling outage. Inspection personnel are certified VT-2 Level II or III examiners.

The ISI program requires that all ASME Class 1 components receive a VT-2 visual examination each refueling outage. This includes the pressurizer. STPEGS performs a visual examination of the Class 1 pressure boundary piping and the connections coming from the pressurizer at the end of each refueling outage at normal operating pressure. The ASME Section XI Code allows performance of VT-2 visual examinations with the insulation installed. These ISI visual examinations require certified VT-2 examiners.

The Class 1 nozzle safe end welds on the three safety valve lines, the relief valve line, and the spray line have been scoped into the ISI Plan and ultrasonically (UT) inspected. The most recent STPEGS non-visual inspections are listed in Table 3 below. Subsequent UT examinations of the safe end welds will be performed with certified Level II or III personnel qualified in accordance with Appendix VIII of ASME Section XI.

Table 3 – Recent Non-Visual ISI of Pressurizer Upper Head Nozzle Safe End Welds

Unit	Nozzle	Line Number	Inspection type(s)	Refueling Outage
1	Safety (N3)	6-RC-1004	UT & PT	Fall 1989
1	Safety (N4C)	6-RC-1009	UT & PT	Fall 1992
1	Safety (N4B)	6-RC-1012	UT & PT	Fall 1992
1	Relief (N4A)	6-RC-1015	UT & PT	Fall 1989
1	Spray (N2)	6-RC-1003	UT & PT	Spring 1995
2	Safety (N3)	6-RC-2004	UT & PT	Fall 1990
2	Safety (N4C)	6-RC-2004	UT & PT	Fall 1995
2	Safety (N4B)	6-RC-2004	UT & PT	Fall 1995
2	Relief (N4A)	6-RC-2004	UT	Fall 2002
2	Spray (N2)	6-RC-2003	UT & PT	Spring 1997

The STPEGS inspections of the pressurizer penetrations demonstrated that the applicable regulatory requirements are satisfied because there was no evidence indicating pressure boundary leakage from the pressurizer, nor was there evidence of corrosion or wastage.

As described in the applicable regulatory requirements section of NRC Bulletin 2004-01, several provisions of the NRC regulations and plant operating licenses pertain to reactor coolant pressure boundary (RCPB) integrity and the issues addressed in the Bulletin. The Bulletin cites the following regulatory requirements as providing the basis for the bulletin assessment:

- Appendix A to 10 CFR Part 50, General Design Criteria (GDC) for Nuclear Power Plants
- GDC 14 – Reactor Coolant Pressure Boundary
- GDC 31 – Fracture Prevention of Reactor Coolant Pressure Boundary
- GCD 32 – Inspection of Reactor Coolant Pressure Boundary
- Plant Technical Specifications

- 10 CFR 50.55a, Codes and Standards, which incorporates by reference Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, of the ASME Boiler and Pressure Vessel Code
- Appendix B of 10 CFR Part 50, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, Criteria V, IX, and XVI

GDC 14 specifies that the RCPB be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. GDC 31 specifies that the RCPB be designed with sufficient margin to assure that the probability of rapidly propagating fracture is minimized. GDC 32 specifies that components that are part of the RCPB be designed to permit periodic inspection and testing of important areas and features to assess their structural and leak tight integrity.

As part of the original design and licensing of STPEGS, STPNOC demonstrated the design of the RCPB meets these requirements. STPEGS complied with these criteria in part by: 1) selecting corrosion resistant austenitic and ferrous materials with extremely high fracture toughness for RCPB materials; and 2) following NRC approved codes and standards for fabrication, erection, and testing of the pressure boundary parts. STPNOC has implemented the required ASME Section XI examinations in accordance with the STPEGS ISI Plan. As described above, the requirements established for design, fracture toughness, and inspectability in GDC 14, 31, and 32, respectively, were satisfied during the initial design and licensing, and continue to be satisfied during operation, even though instances of stress corrosion cracking have been identified in other pressurizers at other nuclear power plants.

Based upon the previous STPEGS inspection history and with no evidence of pressure boundary leakage or evidence of corrosion or wastage, STPNOC is confident that pressurizer integrity meets regulatory requirements.

Plant Technical Specifications:
The limits for STPEGS RCPB leakage are provided in Technical Specification (TS) 3.4.6.2 (i.e., 1 gallon per minute for unidentified leakage; 10 gpm for identified leakage; and no RCPB leakage). Routine surveillance testing is performed to ensure these requirements are met. Based on the few instances of flaws or leakage in industry experience, leaks from pressurizer Alloy 82/182 welds have been well below the sensitivity of on-line leakage detection systems. If measurable leakage is detected by the on-line leak detection systems, the leak will be evaluated per the TS, and the plant will be shut down if required. Upon detection and identification of a leak, corrective actions will be taken to restore RCPB integrity. STPNOC continues to meet the requirements of this TS.

Inspection Requirements (10 CFR 50.55a and ASME Section XI):
The Bulletin describes the requirements for inspection in accordance with the ASME Code, detection of leakage from insulated components, and the acceptance standards if through-wall leakage is detected. STPNOC has complied with the inspection requirements for the Alloy 82/182 welds as part of the STPNOC Inservice Inspection Plan. In addition, the

insulated pressurizer and piping areas are also inspected through the boric acid control program walkdowns each outage.

Quality Assurance Requirements (10 CFR50, Appendix B):
The Bulletin states that special processes, including nondestructive testing, shall be controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criterion, and other special requirements, as required by 10 CFR 50, Appendix B, Criterion V (Instructions, Procedures, and Drawings) and, Criterion IX (Control of Special Processes). STPEGS programs comply with these requirements.

As described above, STPNOC has performed routine inspections of these welds as required by the STPEGS ISI Plan. These inspections have been performed and documented in accordance with ASME Section XI as described in STPNOC ISI program procedures. As described above, STPNOC has committed to perform visual inspections of these welds on an ongoing basis. Qualified personnel using qualified procedures, in accordance with 10 CFR 50 Appendix B requirements, will conduct the inspections.

Criterion XVI of 10 CFR 50 Appendix B states that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. For significant conditions adverse to quality, the measures taken shall include root cause determination and corrective action to preclude repetition of the adverse conditions.

NRC Request:

(c) *A description of the Alloy 82/182/600 pressurizer penetration and steam space piping connection inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the areas, penetrations and steam space piping connections to be inspected; the extent (percentage) of coverage to be achieved for each location; inspection methods to be used; qualification standards for the inspection methods and personnel; the process used to resolve any inspection indications; the inspection documentation to be generated; and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections are found, indicate what followup NDE will be performed to characterize flaws in the leaking penetrations. Provide your plans for expansion of the scope of NDE to be performed if circumferential flaws are found in any portion of the leaking pressurizer penetrations or steam space piping connections.*

STPNOC Response:

STPEGS will perform a bare metal visual (BMV) inspection of each identified weld location in the STPEGS pressurizer penetration and steam space piping connections with Alloy 82/182 every refueling outage. These BMV inspections will be conducted in the same manner and under the same program requirements as have been previously conducted and described in the response to 1(b) above. Should additional NDE techniques be utilized for

followup examinations, personnel involved will be qualified in accordance with ASME Section XI.

STPNOC expects to continue with these inspections until:

- Regulatory or industry guidance changes,
- STPNOC takes measures to mitigate the effects of PWSCC at these locations, or
- STPNOC acquires sufficient acceptable history to propose a revised inspection and/or frequency.

Any accumulations of boric acid residue on or around the weld areas will be investigated to determine the origin of the deposit. If through-wall leakage is suspected or if through-wall leakage would be masked by leakage from other components, additional NDE techniques such as UT, eddy current or radiographic techniques may be used to characterize any indications. ASME Code requirements for evaluation and repair of any flaws detected will be followed. The inspections will be documented the same as ISI examinations.

During the Unit 1 refueling outage scheduled to begin in March 2005, STPNOC will perform a BMV inspection of the Unit 1 pressurizer Alloy 82/182 welds as described above. Any leakage, degradation or other conditions adverse to quality will be appropriately addressed as stated above.

Based on the information contained in the responses to the preceding questions, and for the following reasons, STPNOC has concluded it has reasonable assurance that the STPEGS pressurizers and connected piping are capable of fulfilling all applicable licensing and design basis requirements.

- If cracking, leakage or degradation is detected during the pressurizer nozzle safe end inspection, corrective actions will be taken in accordance with the STPEGS corrective action program and plant procedures. RCPB cracking, leakage or degradation would be considered a significant condition adverse to quality and appropriate actions, including performing a cause analysis, will be taken.

- In consideration of potential conditions adverse to quality, STPNOC has been actively participating in industry organizations (Westinghouse Owners Group and Material Reliability Program) and continues to be aware of industry experience.

- If through-wall leakage is suspected, additional NDE techniques such as ultrasonic, eddy current or radiographic techniques may be used to characterize any indications. ASME Code requirements will be followed for evaluation and repair of any flaws detected.

- If circumferential flaws are found in any portion of the Alloy 82/182 pressurizer welds, additional NDE techniques such as ultrasonic, eddy current or radiographic techniques will be used on all of the welds listed in Table 1 to determine the extent of condition and to identify any other evaluation or repairs required by the ASME Code.

NRC Request:

(d) In light of the information discussed in this bulletin and your understanding of the relevance of recent industry operating experience to your facility, explain why the inspection program identified in your response to item (1)(c) above is adequate for the purpose of maintaining the integrity of your facility's RCPB and for meeting all applicable regulatory requirements which pertain to your facility.

STPNOC Response:

To date, flaws in Alloy 82/182 welds have been detected through visual examination or routine inspections required by the ASME Section XI Code. As discussed in NRC Information Notice (IN) 2004-11, flaws in pressurizer welds were determined to be axial. These flaws are not expected to propagate into the carbon steel vessel or stainless steel piping components. The flaws reported in IN 2004-11 and industry experience such as the V.C. Summer hot leg weld crack have not been near critical flaw size, and have retained significant strength and weld integrity.

The STPEGS Unit 1 and Unit 2 pressurizers do not contain Alloy 600 heater sleeves and welds, and leakage through stainless steel heater sleeves has not been reported.

As stated above, STPNOC will perform a bare metal visual (BMV) inspection of each identified weld location in the STPEGS Unit 1 and Unit 2 pressurizers with Alloy 82/182 every refueling outage. The list of those locations is provided in Table 1. STPNOC will remove sufficient insulation to allow a BMV inspection of each of the welds containing Alloy 82/182 weld material. These inspections provide adequate assurance that any leakage will be detected at an early stage and corrected to ensure continued compliance with GDC 14 and 31 and retain an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.

NRC Request:

(2) Within 60 days of plant restart following the next inspection of the Alloy 82/182/600 pressurizer penetrations and steam space piping connections, the subject PWR licensees should either:

(a) submit to the NRC a statement indicating that the inspections described in the licensee's response to item (1)(c) of this bulletin were completed and a description of the as-found condition of the pressurizer shell, any findings of relevant indications of through-wall leakage, followup NDE performed to characterize flaws in leaking penetrations or steam space piping connections, a summary of all relevant indications found by NDE, a summary of the disposition of any findings of boric acid, and any corrective actions taken and/or repairs made as a result of the indications found,

or

(b) if the licensee was unable to complete the inspections described in response to item (1)(c) of this bulletin, submit to the NRC a summary of the inspections performed, the extent of

the inspections, the methods used, a description of the as-found condition of the pressurizer shell, any findings of relevant indications of through-wall leakage, followup NDE performed to characterize flaws in leaking penetrations or steam space piping connections, a summary of all relevant indications found by NDE, a summary of the disposition of any findings of boric acid, and any corrective actions taken and/or repairs made as a result of the indications found. In addition, supplement the answer which you provided to item (1)(d) above to explain why the inspections that you completed were adequate for the purpose of maintaining the integrity of your facility's RCPB and for meeting all applicable regulatory requirements which pertain to your facility.

For lines attached directly to the pressurizer, with the exception of the surge line, the information requested in (1) and (2) above should be provided for any locations, including those remote from the pressurizer shell, which contain Alloy 82/182/600 materials which are exposed to conditions similar to those of the pressurizer environment.

STPNOC Response:

STPNOC will provide the requested information within 60 days after plant restart following the next inspection of the Alloy 82/182 pressurizer penetrations and steam space piping connections for STPEGS Units 1 and 2.

Commitments

The commitment below has been entered into the STP Corrective Action Program (CAP) for tracking. The CAP meets the requirements of NEI 99-04, Rev. 0, "Guidelines for Managing NRC Commitment Changes." There are no commitments other than the following in this letter:

1. STPEGS will perform a bare metal visual (BMV) inspection of each identified weld location in the STPEGS pressurizer penetration and steam space piping connections with Alloy 82/182 every refueling outage.

   Due Date/Event:
   Every Refueling Outage until:
   - Regulatory or industry guidance changes,
   - STPNOC takes measures to mitigate the effects of PWSCC at these locations, or
   - STPNOC acquires sufficient acceptable history to propose a revised inspection and/or frequency.

2. Results of inspection will be provided to the NRC within 60 days of a plant restart following the next inspection of the Alloy 82/182 pressurizer penetrations and steam space piping connections for STPEGS Units 1 and 2.